

On Page 3, please replace the paragraph starting on line 22 and ending on line 28 with

To read the supercurrent state associated with the island, a single electron transistor (SET) or parity key can connect the island to ground. When the SET is biased to conduct, the current through the SET collapses supercurrent state to a state with fixed magnetic moment and fixes the supercurrent in that state. Thus, upon completion of a calculation, a control circuit biases the SET to conduct, and the magnetic moment at the Josephson junction is fixed in a particular state and can be dependably read.

On Page 12 and 13, please replace the paragraph starting on line 23 of Page 12 and ending on line 8 of Page 13 with

Figs. 4A and 4B respectively show plan and cross-sectional views of a quantum coherer 400 having a vertical architecture according to another embodiment of the invention. Quantum coherer 400 includes a superconductor bank 410, a mesoscopic superconductor island 420, and a Josephson junction 430, formed on an insulating substrate 440. A fabrication process for quantum coherer 400 grows a d-wave superconductor film on substrate 440 to a thickness less than about 0.2 μm and patterns the film to form island 420. Insulative sidewall spacers 450 are then formed on island 420. Such spacers can be conventionally formed by depositing and patterning an insulative layer or by a self-aligned process that anisotropically etches a conformal insulative layer formed on substrate 440 and island 420. A layer of a normal conductor such as gold is deposited on the resulting structure to a thickness between about 0.1 μm and about 0.3 μm and patterned to form a normal conductive region of Josephson junction 430. The normal conductive region extends over island 420 and at least part of sidewall spacers 440. Finally, a layer of an s-wave superconductor is deposited on the structure and patterned (if necessary) to form bank 410. The thickness of bank 410 is not critical to the operation of quantum coherer 400.

On Page 13, please replace the paragraph beginning at line 9 and ending at line 26 with

Fig. 5 shows a cross-sectional view of a quantum coherer 500 having a hybrid vertical/horizontal architecture according to another embodiment of the invention. Quantum coherer 500 includes a superconductor bank 510, a mesoscopic superconductor island 520, and a Josephson junction 530, formed on an insulating substrate 540. A fabrication process for quantum coherer 500 grows a d-wave superconductor film on substrate 440 to a thickness less than about 0.2 μm and patterns the film to form island 520. The patterning can leave sides of island 520 perpendicular to the surface of substrate 540 or any desired angle. A layer of a normal conductor such as gold is deposited on the resulting structure to a thickness between about 0.1 μm and about 0.3 μm and patterned to form a normal conductive region of Josephson junction 530. In this embodiment, the normal conductive region extends over island 520 and is in contact with at least one sidewall of island 520. Finally, a layer of an s-wave superconductor is deposited on the structure and patterned (if necessary) to form bank 510. The phase difference in the superconducting order parameter from bank 510 to island 520 depends on the relative crystal orientation between the top surface of island 520 and the